

BOOK REVIEW

SLIDING FRICTION, Physical Principles and Applications, Bo N. J. Persson, Springer-Verlag, Berlin, Germany, 1998

Sliding friction is of great importance for nearly every traditional or modern technology. Until about 10 years ago tribology was mainly an empirical engineering science going back to Leonardo da Vinci. The 'law' of dry friction was explained by assuming that the net solid contact force, and thus the shearing resistance, is proportional to the normal force. Stick-slip was 'explained' by assuming a decrease in the coefficient of friction with sliding velocity. Over the past ten years several condensed matter physicists have tackled this field with modern experimental and theoretical methods. BNJ Persson, a theorist working in Jülich/Germany, is now presenting his book on physical foundations and applications of sliding friction.

The reader is led through the essentials from the very beginning; a preliminary explanation of Amonton's law, slip-stick motion and modern microscopic observations. Elastic and plastic deformations are then considered at the micro and macro scales with adsorbates and fluid films. The outline continues with acoustic and electronic emissions and phase transitions in thin interfaces. Thermal activation is introduced in order to explain creep, diffusion and relaxation. Theoretical

concepts of hydrodynamics, heat conduction and capillarity are also invoked. A lot of physics is in fact required to better understand the sliding friction!

The central theme of the book is stick-slip at different length and time scales. Although different mechanisms are involved, a common theoretical feature arises. This helps to better understand not only the classical mechanical devices but also earthquakes, sliding on ice and snow, lubrication of human and animal joints, charge density waves (scarcely for engineers), rolling resistance and even muscle contraction.

This is a fascinating book. With all his modern physics, the author is able to transform the field of sliding friction from a few black box assumptions to a rich and beautiful science. Every engineering scientist, particularly one who is involved with granular matter, should have and repeatedly read this book.

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